Health impact of the Israeli invasion on Nablus

Article *in* Eastern Mediterranean health journal = La revue de santé de la Méditerranée orientale = al-Majallah al-ṣiḥḥīyah li-sharq al-mutawassiṭ · January 2007

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Letters to the Editor

Chlorine residual efficiency in inactivating bacteria from secondary contamination

Sir

I read the article by A. Tavakoli, R. Yazdani, M.R. Shahmansouri and B.N. Isfahani entitled "Chlorine residual efficiency in inactivating bacteria from secondary contamination" (*Eastern Mediterranean health journal*, 2005, 11(3):425–34) and was a bit uneasy about its findings and conclusions for the following reasons.

1. The authors did not touch on any precautions taken to ensure that spiking the different samples with bacterial suspensions would not result in introducing organic matter or suspended materials in water, which could have a dramatic effect on the efficacy of disinfection.
2. Apart from chlorine concentration and contact time of chlorine in water, disinfection efficacy depends on many factors, including pH, temperature, presence of readily oxydable substances in water (including organic substances), and turbidity. For this study:
   a. A range for pH values was reported for the samples set; these values are quite compatible with efficient water chlorination and it may be supposed that the "spiking" had not altered the pH to a degree that chlorination efficacy would have been compromised. Yet, reporting the pH value of water samples after spiking would have been useful.
   b. A temperature range was reported for the samples set, but not the actual temperature(s) at which the experiments were conducted.
   c. The total organic carbon (TOC) was used as an indicator for organic matter in the water (with the possible exception of samples for which the residual chlorine concentration was nil, presumably there were no other readily oxydable substances in water). The TOC was not reported for water samples after spiking, which would have provided an indication about the organic load added to the water during the spiking.
   d. The authors did not report the turbidity of water samples before or after spiking; this is of critical importance, since the chemical disinfection efficacy is compromised in turbid water (the presence of particulate matter in water protects micro-organisms against the action of the chemical disinfectant).
3. With regard to the residual chlorine:
   a. The authors report only total residual chlorine, which is the sum of free residual chlorine (the disinfection efficiency of which is well established) and combined residual chlorine (the disinfection efficiency of which is lower than free residual chlorine and is in fact undefined, unless the individual compounds are known). The most common forms of combined residual chlorine are chloramines that are known to have a slower disinfection effect.
   b. The authors did not report the residual chlorine of water samples at the end of their experiments (after 100 minutes contact time); this would have indicated if there was enough chlo-

rine added to ensure adequate water disinfection.

4. Even if precise data are not provided, the spiking resulted in very high initial bacterial counts in water (around 10^8/100 mL) that are orders of magnitude higher than normally encountered in raw water used for the production of potable water.
5. Even though the authors indicate that the bacterial counts in the spiked water were determined by spectrometric measurement of the bacterial suspension (neither the wavelength used for the measurement nor the targeted absorbance was reported), these initial bacterial counts vary widely [by a factor of around 50 for *E. coli* (Figure 3), and around 100 for *A. hydrophila* (Figure 4)]. This wide variation in initial counts may possibly explain the unexpected results shown in Figure 3 regarding the lower "mean survival rates" in the presence of low residual chlorine concentration (0–0.1 mg/L) than for the higher residual chlorine concentration range (0.11–0.30 mg/L).
6. In Figures 3 to 6, the results are presented in terms of "mean survival rates"; actually mean bacterial counts (not rates) are presented. Furthermore, for bacterial counts, median values are more robust than mean values.
7. Despite the methodological problems outlined above, the results reported in Figure 3 for *E. coli* (which is still the best indicator for water safety in relation to bacterial contamination) may be read in a different way. For the range of residual chlorine concentrations usually found in water distribution systems (0.3–0.5 mg/L), the abatement in the bacterial count is of about 3 decimal logs (99.9%) after 1 minute contact time, about 4 logs (99.99%) after 10 minutes, and probably 5 logs (99.999%) after 30 minutes, which is the reference time used for ensuring safety. Had the initial bacterial counts been more in the range normally encountered in raw waters used for the production of potable water, and free rather than total residual chlorine were used, the conclusions drawn by the authors may have been more reserved.

In view of the above-mentioned considerations, I believe the conclusion that "… total chlorine levels of less than 0.71 mg/L in water supply systems cannot provide the recommended safety level" is not justified by the results. This is not to say that I believe that the presence of free residual chlorine in the drinking water distribution system at the recommended concentration of around 0.5 mg/L does protect effectively against the recontamination by wastewater in the distribution system, only that the results presented do not warrant the authors drawing this conclusion and the discussion is still open in that regard.

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Authors' response

Thank you for your comments. With this letter we will try to reply to the opinions expressed by Dr Abouzaid.

1. All the works were undertaken by standard methods (according to references 10, 18 and 19).
2. a. The pH values of all our samples were around the range between 8.0 and 8.2 during spiking.

b. The temperature during the work was fairly constant (around room temperature).

c. The total organic carbon (TOC) was measured at the beginning and the end of the experiment. But these results are not reported in the article.

d. There were no changes in turbidity before and after spiking; these results are not reported in the article.

3. a. The main aim of this study was to assay the effect of total residual chlorine used in Islamic Republic of Iran. Therefore we just measured the total residual chlorine and did not measure and compare with the other chlorine compounds.

b. The total residual chlorine was measured and the water containers were tightly closed during the experiments. The total residual chlorine changes were minimal.

4,5. The bacterial counts were done by McFarland nephelometer standards and also serial dilution methods. We also used the experiments of other researchers according to the references presented.

6. According to similar research, the mean bacterial counts can be used. At the same time, your opinion is correct.

7. In this study the determination of the chlorine residual efficiency in inactivating bacteria after secondary contamination in the Isfahan drinking water system was our main objective and we did not want to compare it with raw water supplies.

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Health impact of the Israeli invasion on Nablus

Sir

On 3 April 2002, the Israeli army re-invaded Nablus city in the West Bank and occupied it until 21 April. As a result the city suffered major devastation.

A few weeks after the Israeli withdrawal, 21 physicians working in governmental, nongovernmental and private clinics in the city were interviewed to gain an idea of the health impact of the invasion. The physicians were asked about the number of cases of certain diseases they encountered during and after the invasion compared with the same time in the previous year.

Their responses indicated that the re-invasion and destruction of infrastructure by the Israeli military forces had resulted in an increase in water-, sanitation- and air-related diseases, thus endangering the health of the overall population. The impact on the health of the population was clear. However, this survey only partially revealed the impact of the invasion. In fact, the health situation further deteriorated after that period and added to the suffering of the population, which was already experiencing extreme hardship and insecurity.

The re-invasion not only had an impact on the health of the people in the affected areas but also extended to surrounding communities that were deprived of environmental health inspection and environmental control measures intended to minimize health consequences.

The survey of physicians was a preliminary survey and more extensive research is

required to monitor the situation in terms of health risks. However, the ultimate solution will only be through the elimination of situations that facilitate the spread of disease and the cessation of invasion, siege and occupation.

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Evaluation of needle-stick injuries among health care workers in Isfahan province, Islamic Republic of Iran

Sir

Health care workers (HCWs) are at-risk for infections with blood-borne pathogens such as human immunodeficiency virus, hepatitis B virus and hepatitis C virus from occupational blood-exposure through injuries with sharp instruments and needlesticks [*1*–*7*]. In the United States of America 86% of job-related bloodborn infections are caused by needle-stick injuries [*3*]. It has been estimated that as many as 40%–70% of all needlestick injuries are unreported [*8*]. Needle-stick injuries can be prevented, for example, by using safe needle devices and training HCWs to dispose of them properly; this protects the staff against bloodborn infections as well as reducing the high cost of follow-up.

In the Islamic Republic of Iran, the extent of unreported needle-stick and sharps injuries is not known. A survey in 1 hospital in Isfahan in 2003 found that 55% of staff had been injured by contaminated sharp devices at least once that year [*1*]. We carried out a descriptive survey of injuries by needle and other sharp devices in 11 hospitals of Isfahan province during 2003 to establish the rate and pattern of injuries. A sample of 1350 paramedical staff, doctors and other workers in the surgery, internal medicine, laboratory, X-ray and laundry departments were invited to complete a questionnaire about the time, place and method of injuries, steps taken after the injuries and standard precautions related to needle-stick injuries while working.

Out of 1118 HCWs who completed and returned questionnaires 686 (61.4%) had been injured by needles in 2003 (Table 1). A total of 289 (25.5%) had been injured more than twice, 42.1% of those ever injured. The percentages ever injured were 66.5% in paramedical staff, 48.5% in cleaning workers and 47.2% in doctors. The surgery wards had the highest rate of injury (64.5%). The average number of injuries per HCW was 1.27 sharps injuries per year.

The most common action at the time of injury was recapping needles (36.6% of injuries), followed by during injections (19.0%), blood sampling (13.8%) or waste disposal (11.8%) (Figure 1).

In this study only 6% (41 HCWs) reported using hepatitis B immunoglobulin (HBIg) as a precaution against hepatitis B.

This study confirms other studies in the Islamic Republic of Iran [*1*] and different countries [*2*–*6*] that the rate of needle-stick injury among HCWs is high. HCWs are regularly exposed to dangerous sharp devices as well as poor management in disposing of sharp devices and they often follow incorrect practices such as recapping needles. Appropriate planning and suitable training is urgently needed to minimize this problem, and also by using safe needle devices in health care centres.

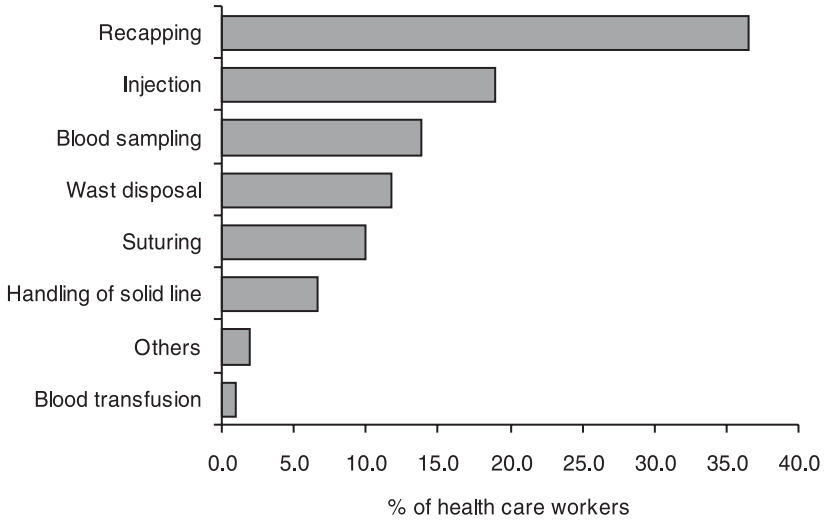

Figure 1 Action undertaken when needle-stick injury occurred (*n* = 686 health care workers)

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